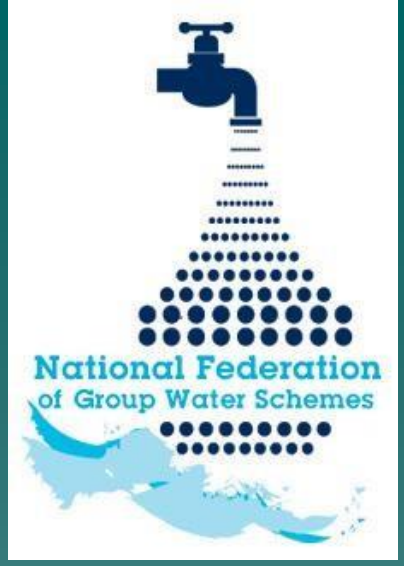

THM formation in drinking water supplies: a GWS perspective

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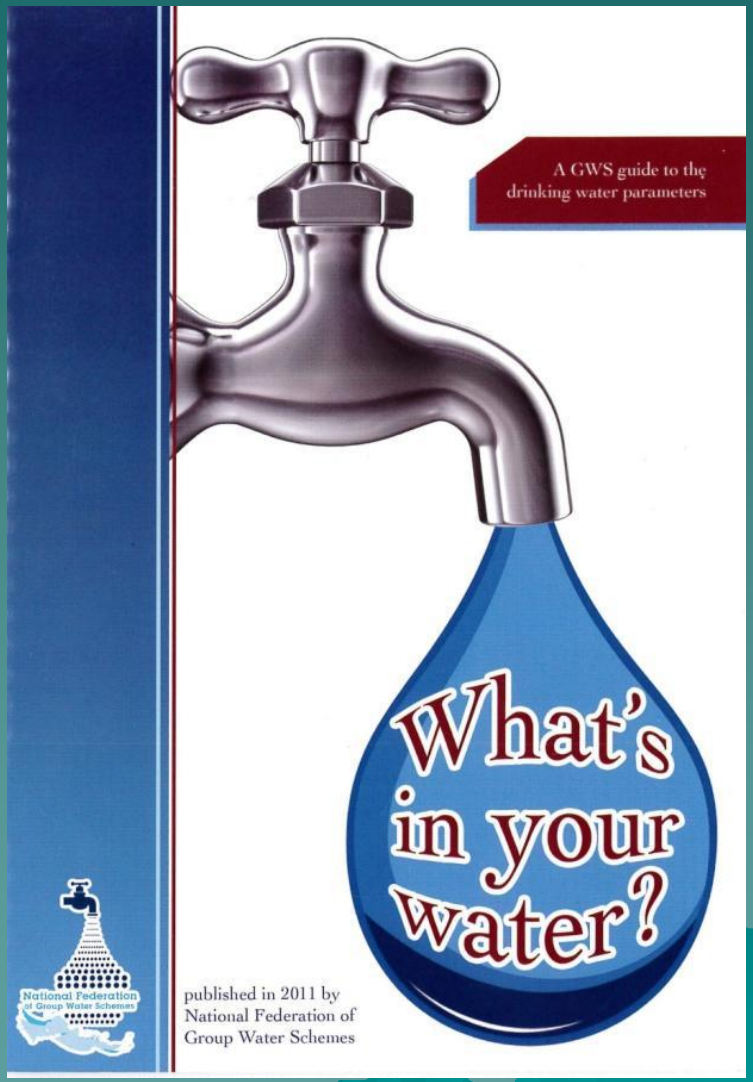
Understanding the issue

- THMs are liable to form where chlorine reacts with organic molecules in water.
- 'There is a fairly straightforward relationship between the degree of colour in water prior to chlorination and the quantity of THMs present following chlorination.' EPA



… which led us to conclude that

- ‘THMs are an issue for surface water supplies and for groundwater supplies influenced by surface waters
- ‘The presence of THMs tells us that a treatment system needs to be introduced/adjusted to reduce colour
- ‘[Schemes should] check colour levels following the filtration process.’

But were we correct?

- This presentation will propose that an evidence-based approach be adopted to determine risk
- It will suggest that total organic carbon (rather than colour) is the parameter that we should focus on
- It will argue that excessive chlorination prior to storage must be considered as part of any risk reduction strategy
- It will also challenge the hypothesis that THM exceedances on publicly sourced GWS supplies arise as a result of poor network maintenance

Two GWS categories

- Privately sourced group water schemes
  - Responsible for sourcing, treating and distributing a water supply
- Publicly sourced group water schemes
  - Get treated water supply from public (Irish Water) network
  - Responsible for distribution only

Characteristics of the 360 privately sourced schemes

- Size:
  - Range from 2 to 1,963 households
  - More than half have 100 households or less
- Source type
  - Predominantly groundwater sources
    - 188 borewell
    - 94 spring
    - 78 lake/river/mountain stream
- Population density
  - Average of 154 kilometres of distribution main per 1,000 households

Analysis of compliance monitoring results on borehole supplies in 2014

- 104 schemes sampled for TOC/THMs
- 78 recorded TOC ≤ 2mg/litre, of which 14 show THM formation
- 26 recorded TOC > 2 mg/l
- Schemes with reservoirs most likely to experience THM formation
- Colour is not an issue
- Little (if any) risk

Analysis of compliance monitoring results on spring supplies in 2014

- 48 schemes sampled of which 28 recorded TOC ≤ 2mg/litre.
- 18 recorded TOC > 2 mg/l of which 4 recorded TOC > 4 mg/l, with one THM failure
- TOC results were not given for 2 schemes
- Colour not an issue
- Low risk, other than where there is evidence of significant variation in raw water quality + inadequate treatment

Analysis of compliance monitoring results on surface supplies in 2014

- 57 schemes sampled of which 5 recorded TOC ≤ 2mg/litre.
- 26 recorded TOC levels between 2-4 mg/l of which 3 had THM failure
- 26 schemes had >4mg/l with 12 failures
- High risk of THM formation
- Coagulant dosing linked to automated raw water monitor reduces risk

Publicly sourced schemes

- Insufficient evidence to support the theory that poor maintenance of pipework cause of THM exceedances
- TOC/THMs should be sampled on the parent scheme on the same day that sampling is conducted on pGWS
- The rate of chlorine dosing + reservoir storage capacity should also be recorded

Observations on sampling/analysis

- Consideration should be given to sampling all surface water supplies during periods of identified greatest risk
- TOC should always be sampled when sampling for THMs, while the rate of chlorine dosing + reservoir storage capacity should also be recorded
- Be careful with dating system in Excel

Conclusions

- We need to understand why/how THMs form to a greater extent in some surface supplies than in others and what is driving their formation
- Filtration processes need to be optimised by linking coagulant dosing to automated systems and by reducing water demand
- We should rethink the current approach to chlorination. In particular, we should avoid storing large volumes of excessively chlorinated water in reservoirs

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